



The U.S. Environmental Protection Agency's **ENERGY STAR® Program** promotes the use of high-efficiency technologies and equipment. ENERGY STAR labeled homes use at least 30% less energy than homes built to meet the national Model Energy Code while maintaining or improving indoor air quality. These fact sheets are designed to help consumers learn more about the energy-efficient improvements to their ENERGY STAR labeled homes.

AIR SEALING

BUILDING ENVELOPE IMPROVEMENT

Air will leak through a building envelope that is not well sealed. This leakage of air decreases the comfort of a residence by allowing moisture, cold drafts, and unwanted noise to enter and may lower indoor air quality by allowing in dust and airborne pollutants. In addition, air leakage accounts for between 25 percent and 40 percent of the energy used for heating and cooling in a typical residence.

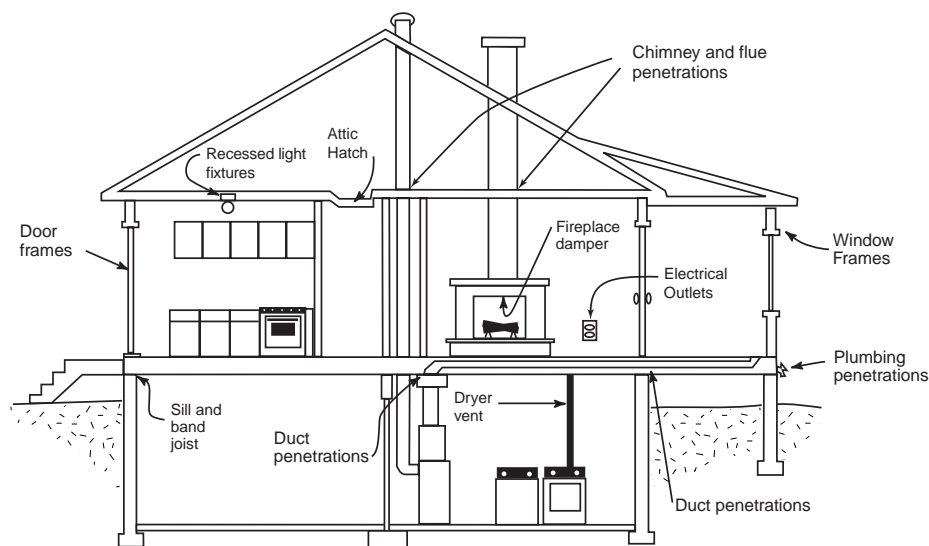
The amount of air leakage in a house depends on two factors. The first is the number and size of air leakage paths through the building envelope. As shown in Figure 1, these paths include joints between building materials, gaps around doors and windows, and penetrations for piping, wiring, and ducts. The second factor is the difference in air pressure between the inside and outside. Pressure differences are caused by wind, indoor and outdoor temperature differences (stack effect), chimney and flue exhaust fans, equipment with exhaust fans (dryers, central vacuums) and ventilation fans (bath, kitchen). To

prevent air leakage, it is important to seal the building envelope during construction prior to installation of the drywall. Once covered, many air leakage paths cannot be accessed and properly sealed. There are many products available for air sealing including caulks, foams, weatherstripping, gaskets, and door sweeps.

Air sealing the building envelope is one of the most critical features of an energy efficient home. Look for the results of a "blower door" test (typically included with a Home Energy Rating) to ensure that your ENERGY STAR labeled home had all air leakage paths identified and sealed using appropriate materials.

Once a house is tightly sealed, you will want to make sure there is adequate fresh air for ventilation. It is better to use controlled or active ventilation than to rely on air leakage. In many ENERGY STAR labeled homes, an active ventilation system is installed along with air sealing to ensure that fresh air is provided.

FIGURE 1: LOCATION OF COMMON AIR LEAKAGE PATHS



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RESOURCES

The Consumer Guide to Home Energy Savings (Wilson and Morrill), 5th edition, 1996, available from the American Council for an Energy Efficient Economy at 510-549-9914

Homemade Money (Heede and the staff of RMI), 1995, available from the Rocky Mountain Institute at 970-927-3851

Caulking and Weatherstripping fact sheet available from the Energy Efficiency and Renewable Energy Clearinghouse (EREC), P.O. Box 3048, Merrifield, VA 22116, 1-800-DOE-EREC (1-800-363-3732)

BENEFITS

Air sealing the building envelope can provide many benefits including:

Improved comfort. A tighter building envelope reduces the amount of unconditioned air, drafts, noise, and moisture that enter your home. Proper air sealing will also minimize temperature differences between rooms. As a result, tight envelopes can maintain a more consistent level of comfort throughout a house.

Improved indoor air quality. A tighter building envelope reduces the infiltration of outdoor air pollutants, dust and radon as well as eliminating paths for insect infestation. Properly sealing the building envelope will also reduce moisture infiltration from outdoor air in humid climates.

Increased quality. Building codes establish the legal minimum construction standards. ENERGY STAR labeled homes, constructed to exceed these codes with air sealing, can offer a better quality product.

Lower utility bills. Air leakage accounts for 25 percent to 40 percent of the energy used for heating and cooling and also reduces the effectiveness of other energy-efficiency measures such as increased insulation and high-performance windows. Thus, air sealing results in lower utility bills.

Fewer condensation problems. Condensation can lead to mold and mildew problems. In hot, humid climates, moisture can enter into wall cavities through exterior cracks and result in costly damage

to framing and insulation. In cold climates, gaps in the interior walls allow moisture from warm indoor air to enter wall cavities and attics. This moisture can condense on cold surfaces and lead to structural damage. By significantly reducing air leakage, ENERGY STAR labeled homes can reduce or eliminate these problems.

Reduced obsolescence. Based on recent trends for improved efficiency and higher indoor air quality, tighter building envelopes are expected to become standard practice for the building industry. Since it is both difficult and costly to make the building envelope tighter after a house is constructed, it is best to seal all joints, holes and seams during construction. ENERGY STAR labeled homes constructed to exceed current building codes are therefore, expected to be less vulnerable to obsolescence.

Improved resale position. Air sealing a home can provide the many impressive benefits discussed above and lead to a more comfortable, quieter and better quality home with lower utility bills, fewer condensation problems, and reduced obsolescence. These benefits can translate into higher resale value.